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THE

Madras Forest College Magazine.

(PUBLISHED QUARTERLY).

Vol. XIX. SEPTEMBER 1934. No. 1

The Managing Committee do not hold themselves responsible for opinions expressed by contributors.

Elephants and their Management.

By, K. A. Muddayya, M. R. H.

The Madras Forest department purchased their first elephants from the Military department which possessed "Burma elephants" that are well known for their good work, and whose grand-children are still in the Department. Though some more elephants were subsequently purchased from the adjoining states, the number was found insufficient to cope with the increased extraction of timber. The department therefore began capturing operations by the pit-method in some of the districts of Ooty and Coimbatore circles; and as a result several wild elephants were captured and added to the stock.

The captures had necessarily to be well trained, stage by stage, before being put to work. As training in every district separately would entail unduly large additional establishment, all the new captures were collected, to form a "nursery" camp at Mudumalai Range in the Nilgiri district. The nursery camp was a shifting one moving periodically to a new locality in order to avoid rendering

the camp too insanitary and also to avoid overgrazing in the locality. Elephants were also captured in localities where they proved a pest to the ryots. Thus the stock of elephants with the Madras Forest Department very soon increased and also the cost of maintenance. The latter became so heavy that in recent years the underaged and overaged animals had to be sold retaining the selected ones for departmental work. Along with this the trained elephants were distributed to other districts where they were needed. Animals under 12 years are considered to be too young for work.

The introduction of these draught animals in the Madras Forest Department necessitated a veterinary staff consisting of an Inspector of Livestock and a few Assistant Veterinary Inspectors. The former is a gazetted officer of the Forest department and the latter are borrowed from the Madras Veterinary department.

Elephants are of three types, viz. (1) Koomerah band (2) Bor-meergah band and (3) Meergah band. The animals with short hind legs, a gentle sloping back, very thick skin with wrinkles, broad heads and scarcely growing more than 7′ 6″ in height are of the Koomerah band. These are best suited for timber dragging work. The second kind is the one most commonly found in south India. They are tall and fairly stout with broad heads. The last named are sluggish looking, lean, with narrow heads and are commonly used for riding and baggage purposes as they take long strides and are not well suited for dragging logs.

Though elephants are the biggest of animals they are very delicate, and hence require the greatest care and attention in captivity. In Madras a Forester or a Forest Guard (according to the number of elephants in the

station) is entirely in charge of the elephant camp. In most cases the Forester will have a Jamedar under him. Besides these supervisers each animal will have a *Mahut* and a *Cavady* as its attendants, to work them and to look after them. The Forester or the Forest-Guard is solely responsible to the Range officer for the correct maintenance of accounts, feed and upkeep.

To keep these animals in perfect condition the selection of the camp site is of great importance. It should be chosen on a sloping well drained ground near flowing streams with large bathing pools. The streams should not be too rocky.

Every animal should have two baths a day and a good scrubbing with a cocoanut fibre or with well burnt brick or the husk of the screw pine fruits before it is fed. The elephants are fed twice a day once in the morning and once in the evening with cooked gram, ragi flour, and rice. Raw rice was also tried but many elephants did not relish it; though the Mysore State elephants are accustomed to it. The cooked rations are made into cubical lumps with wooden moulds of specified dimensions. Generally 1 lb. of raw rice when boiled gives 1 lump. Similarly 1 lb. of ragiflour and 1 lb. of gram will give half a lump each; 1/16 th measure of common salt is also given mixed with each meal. A small lump of jaggery is also given to each elephant after the evening meal and before it is turned out to the forest for grazing. This is a habit intended only to make the elephant become attached to the keeper.

Every camp always contains a medicine chest with drugs supplied by the Veterinary Officers, syringe, enema pump, etc. Some ailment or other will generally be found in an elephant camp especially when there are new captures. Sanitation requires particular attention as there are

elephants which refuse food if the camp is filthy. Further, dirty camps harbour and encourage many parasites specially bots, causing diseases. Hence the droppings both in the bathing pool and in the camp should be removed, collected, covered with earth aud the locality disinfected. These dung heaps are burnt when the whether is favourable. It is also a practice to burn the old camp sites and surroundings as soon as the elephants are shifted to a new site.

A peculiarity observed in these animals is that they purge periodically, the period between purgings varying from 3 to 4 months to a year. It is more frequent in the case of new captures. Lazy mahuts, with a view to take rest, sometimes give some herbal medicine along with the feed, and induce purging, thus deceiving the officer in charge.

When an elephant eats sand or mud or the bark of certain trees such as *Careya arborea* it is a sign of the approaching "purging." The grain ration given to the animal is then stopped and suitable medicines administered by the Veterinary Officers. The mere presence of the Veterinary Officers in the camp or when the animal is suffering from purging, makes some elephants never open their month as they seem to know that some medicine will be administered! The purging usually lasts for about 3 days, but may extend sometimes for a week. During this period they are kept tethered and fed with bamboo leaves or other leaf fodder only and no bath is given. When they recover, the grain ration is gradually increased to the full quantity and some tonic is given for another week to tone their nervous systems. The animals themselves throw mud upon their back as protection from excessive cold or sun and insest bites on the back where the trunk cannot reach.

The outbreak of contagious diseases is to be carefully guarded against in an elephant camp. Generally such outbreaks occur where contagious diseases such as rinderpest, prevail among village cattle or amongst wild animals Hence village cattle should never be allowed into the areas generally grazed over by elephants. Further the officer in charge must have an eye in the surrounding forests to see whether wild animals die of any diseases and in that event make immediate arrangement to shift the camp from there. In case there is an out break in the camp all the unaffected animals must be segregated to a camp upstream and the Veterinary Officers should be informed of the outbreak without delay. Whenever there is a sudden death in the camp the blood smear of the elephant must be taken on glass slides either just before its death or within 15 minutes after its death and should be sent at once to the Inspector of Livestock for examination and communication of the result. The disposal of the carcass must however be kept pending until advised by him. Exceptional care against contact with the deceased animals has to be taken in any case of suspected anthrax.

The health of the animals depends upon their work also and hence it is needless to say what amount of care is needed in working them. There have been cases where elephants have died soon after dragging very big logs and such recklessness of ignorant attendants cannot be stopped unless properly supervised. To prevent galls the kit (either dragging or baggage) should be kept always well oiled. Further the elephants should never be worked in the midday hours in hot weather.

For every elephant is prescribed a certain working capacity fixed with reference to its age and height and condition. The new captures are given very light

exercises in the beginning to teach them to obey orders until they are accustomed to timber dragging work. The working capacity is fixed by the Inspector of Livestock every year after considering the lead over which that year's timber is to be dragged. The number of trips to be made per diem is prescribed by him.

Feeding new captures with pieces of sugarcane now and again often helps to tame elephants in a comparatively short time. By this means it has been possible to take some new captures out of the kraal within a week. Generally it takes one month to 6 months to tame an elephant that is, to take it out of the Kraal; young ones become tame sooner than older ones. An aged cow "Lakshmi" captured in Coorg though she could be taken out of the kraal in the course of 6 months could never be trained to work. She kept lean and died 4 years after capture without doing any work. It is not a small surprise that the biggest tusker captured in Coorg in 1930 and named "Viceroy" in remembrance of the visit to Coorg of H. E. Lord Irwin, the late Viceroy of India, was taken out of the Kraal in a month's time. Its height was more than 10 ft.

Until recently the departmental elephants were not used to drag timbers by "Vakkai" method (mouth dragging) while private owned elephants in Malabar always dragged by the mouth. Recently "mouth dragging" has been tried in the Wynaad and Nilambur divisions of the Madras Forest Department with great success and it is likely to take the place of "harness dragging" altogether in the department.

Dragging and riding kit of elephants.

Each elephant is provided with a trailing chain, a pair of hobbles and a bell; a harness dragging kit and a riding kit. The harness dragging kit consists of (1) one

leather or sack numdha stuffed with coir fibre about 7 ft. to 10½ ft. long and 2½ ft. wide (2) a breast rope of 3″ girth about 15 ft. long, fully covered with leather (3) a neck rope of 2″ girth about 10 ft. long and covered with leather (4) 1 pair of wooden blocks called "ghatties" measuring 7″ × 5″ × 15″ (5) 1 pair of leather pieces 1½′ × 1½′. (These are only used when a sack numdha is supplied) (5) A back chain 8′ to 10′ long with rings at both of its ends (7) A drag chain measuring 36 to 40 ft. with hooks at either ends. The riding kit consists of (1) a sack numdha thinly stuffed with coir fibre about 7′ to 10′ long and 3′ to 3½′ wide (2) a gadi 6′ to 7′ × 3′ to 3½′ stuffed with coarse jungle grass or straw and (3) a gadi rope of 1½″ girth about 75 ft. long. It is very important to prepare each kit to the proper measurement of the animals. The kit of an elephant is made to its size and should never be exchanged. Mouth dragging needs only a thick rope of *Sterculia villosa* fibre. It is not every elephant that can be used for riding. An elephant is to be specially trained for riding same as for timber dragging. An elephant with good temper and long strides makes a good riding elephant.

In this Presidency the elephants are let loose for grazing unless there are cultivations in the neighbourhood, and not tethered and fed with cut fodder. They are let loose, into the forest their forelegs being hobbled, and with a trailing chain to one of the hind legs. Sometimes they go 6 to 7 miles away from the camp but usually only 2 to 3 miles. The attendants trace the track of the trailing chains and fetch them back to camp in the morning. Thus obviously the chains and hobbles are to be always in good order. When once an elephant escapes, even the very tame ones pick up automatically their wild nature, the very moment they are free. There have been

exceptions to this as some elephants long in captivity are attracted by the cooked food and thus return back to the camp. Some experienced mahuts say that a tame elephant, though escaped into a herd of wild elephants, usually obeys the cautions of his mahout. But these exceptions should never be taken as a guarantee. However these run-aways will not be entertained or welcomed by the wild herds except rarely by some solitary tuskers. The wild herds run far away at the very smell of their out cast domestricated brother.

The cost of maintenance and the average amount of work turned out is shown in the following example which is the return the Range Officer submits to the District Forest Officer quarterly. The officer-in-charge of the camps should submit his accounts monthly to the Range Officer.

Part of Form No. 16.

Cost of each elephant during the quarter.

(From page 28 of Madras Forest Department and account code.)

No.	Name.	Cost of attendants.		Cost of grains.		Cost of salt, oil, etc.,		Other expenses.		Total		Value of work done during the quarter.	
		Rs.	A.	Rs.	A.	Rs.	A.	Rs.	A.	Rs.	A.	Rs.	A
1	Lakshmi ...	69	0	87	12	4	11	0	0	161	7	453	8
2	Parvathi ...	69	0	87	12	4	11	0	0	161	7	427	12
3	Ganesh ...	69	0	87	12	4	11	0	0	161	7	433	4
4	Maharaja ...	60	0	87	12	4	11	0	0	152	7	400	6
5	Tippu ...	64	8	84	8	6	12	4	8	160	4	393	14
6	Rani ...	66	0	84	8	5	8	3	12	159	12	367	10
7	Shah Jehan ...	24	0	32	8	1	1	0	0	57	9	15	8
	Total ...	421	8	552	8	32	1	8	4	1014	5	2,496	14

Suggestions for more effective methods of educating the public in forest principles and benefits to a community in a wise Forest Policy.

Winning Essay for the Indian Forester Prize for Past Students.

By, T. D. Ponniah, M. R. Hons.

The need for educating the Public :—

The title of the essay, of course, contains a presumption that (1) there is need for educating the public in forest principles; (2) there are benefits to the public resulting from those principles; and (3) our present forest Policy is a wise one. I agree in all the three, but I wish to say a few words by way of particularization, on these points, especially about the nature of the need for educating the public, at present.

First, about the need: India is in a critical state of her history now. By an all wise Providence, she has had, for the past two centuries the more or less full control and guidance of her affairs, vested in the British people. The same all wise Providence appears to purpose, that in future, all or most of her affairs, should be managed by India's own children. Forestry will therefore be, in future, under a minister, who in turn will be under the people, i.e., the mass. It has to be admitted that in the past, the people had not shown themselves favourably inclined towards Forestry principles, in spite of what propaganda we had done and what reconcilation we tried to effect though our efforts in these directions had neither been organized, consistent, nor sufficient. If, therefore the control of our forests pass into the hands of the people without our first making them realize the benefits of a

wise forest policy, the danger of the abuse of our forest and their consequent disappearance, is great.

The realization that there are benefits direct and indirect from forests, is a matter so interwoven with our daily needs of life, that I do not think it necessary to reiterate the benefits here. Then, whether our present Forest policy is entirely wise, is a matter for bigger heads to tackle.

What have been the methods adopted so far, in educating the public in Forest Principles and why have they not been as effective as desired :—

The title of this essay suggests an admission that the methods so far adopted by Government have not been so effective. All thinkers will, no doubt, agree in this. I will first enumerate what had been done in the past—through I am afraid, it will be found to have been, not very much.

After the Great war, about the years 1920 and 1921, the Madras Government had a Publicity officer, who occasionally issued a pamphlet on forestry matters, in vernaculars as well as English. I could not say what circulation these pamphlets had and what affect they produced. This office was, shortly after, abolished and no such work was done, after that.

There has been or used to be a Forest Advisory Committee consisting of M. L. C's, in Madras, to which now and then Government referred for advice on some forest matters. These members naturally had to know something about Forest principles and in their turn propagated such information as they had, though not to any appreciable extent. I could not say whether such a committee is being constituted now-a-days or not. But from my conversations with certain M. L. C's, I have got

the impression that the present day M. L. C's are not sufficiently conversant in Forest matters.

Our Forest College week, the Forest College itself with its sports and functions, to which prominent public men are invited, and our Forest museum, have been doing a certain amount of educative work. The value of the museum, as it educates the masses, cannot be over estimated. But the other items relate only to some educated people and so their scope is not great.

What more can I bring under this item ? Probably our research bulletins, the *Indian Forester*, the *Forest College Magazine*, our Conservators' Inspection notes and our Administration reports ? But, one can confidently say these touch just a fringe of the populace. They do not reach the mass.

I am therefore led to conclude that in the past not much has been done to educate the public in forest matters. So, I think besides trying to find out more effective methods, we should intensify and ensure continuity in our present methods also.

Suggestions for more methods and more effective methods: It has to be remembered that these suggestions are mere outlines of ideas and so full details will have to be thought out if putting them into practice is to be considered.

I divide my suggestions into two parts—viz., (1) what have to be done among ourselves—i.e. in our own house and (2) What have to be done among others—i.e. elsewhere.

The other day I was present when a newly wedded couple took their departure from the bride's house. The bride wept—rather strange in 1934. The bridegroom told her " Why weep ! Am I a tiger or panther that is taking

you away?" It is well known that on the whole, people, especially country people, shy at a forest officer—more so inside the forests. Why? Is it probably due to our general stand-offishness, our unsavoury manners, to the lowly or our swearings and cursings. I think it is so, at least partly. I think we should make the people in general, the meek and the lowly, in particular, feel, by our easy good manners, our helpful talk, our informative conversations and our free movements, that we are their friends—nay more, that we are their own servants. Some time ago I happened to be with a high forest officer, who met a cooly on a right of way in a forest—and who at once said "who is this rascal?" The man understood only the last word and expressed resentment. Have you wondered why we are so easily irritated, or assume and appear as though we have been offended. Is the pose a tradition and imitation? Any way, the effect of such manners on the people, is something deplorable.

Then, are all our watchers and guards people who could understand the beneficial effects of a wise forest policy? They are mostly semi literate or illiterate. Often the local bad men are the easy recruits we get for these jobs. There appears to be no uniformity in the method and manner of recruiting these vital agents of our Forest policy. S. S. L. C. holders are easy to get, now-a-days. Why, then, appoint old cooks and crooks. When our own agents do not understand or appreciate the Forest principles how can we expect the mass to do so? I think the reform needed in this direction is quite urgent. All the good works and intentions of months and years could be easily frustrated in days by an ignorant forest guard.

Next, are we sure about the entire wisdom of some items in our present forest policy?

Why are forest officers in general so averse to having cultivations in forests. What is fit for cultivation should go for cultivation. This, I think, should be our Policy. The departmeut has a tendency to isolate itself. Does not our separation from the Revenue department tend to lead us to isolation? Cultivation in areas fit for same will lead to settlements of people and consequent more contact with them. This, I think is desirable. Forestry is only the handmaid of agriculture. Let her not try to pose as a mistress with a sway of her own. Without constant contact with the people, how can they be educated about the Forest principles and their benefits?

Next, before all, it is important, people should have confidence in us. They must have respect for our words and even the least sign of suspicion in our *bona fides* is detrimental to our object. It is not enough for us to be right, but we should take pains to make the people understand why we are right. We should have nothing which we fear to be subjected to criticism by the public. We should show an eagerness to correct our mistakes. It fact we should welcome criticism. One has an impression that we often resent criticism. Though it may be ill informed criticism, we have to note that it is the first step to illumination.

I have often thought that the system of making our present sort of subordinates, attend to the supplies of our touring officers, can be given up with much advantage to the Department. I think, as things are, our guards and watchers are better made to have no responsibilies in this matter. A little thinking will show the ways in which it affects the people and make them look upon us with suspicion. Officers may be as consciencious as Mr. Peake who used to replace the office light with a private light as soon as official work was over, or as punctilious as a Mr. R.........

who used to smell the lime fruit offered and return it. One is rightly proud of them. But I think our work and intentions suffer somewhat as we are suspect in the eyes of the people due to the present system and better methods should be adopted, in the interests of Forestry.

Now for what is to be done among others or elsewhere:—

I would that the benefits of Forestry be brought to be realized by the future citizens, when, as children they are in schools. Very little is being done now-a-days, in our schools, in this respect. Most of our School and College teachers know little about forestry. Forestry subjects should be included in school curiculams. Booklets and pamphlets to educate the children and their teachers, may be written. Forest officers should make it a point to visit schools and colleges and speak on forestry subjects. Facilities for excursions by school children into Forests, should be given and the children attracted.

Next, I would suggest, with a view to increase the contact between forest officers and the people, all *prombokes*, unreserved forests and Panchayat forests, be brought under the administrative control of the Forest Department. Days there were, when Revenue *Jamabandis* were attended by Forest officers and forestry matters explained to the people. This practice should be revived. Other Government Department officers also should, as far as necessary be educated about our activities and forestry principles.

Advanced countries have game parks and sanctuaries where beautiful trees are grown and people attracted by good motorable roads. Our wild animals in their natural surrounding, our high peaks, our charming water falls, and places of enchanting scenery are all assets which we

are not now utilizing to attract people into our Forests. These should be made accessible to the public.

As in France, people may be allowed on special occasions, to remove small fuel from felled coupes, free, as this will make people think, they have direct benefits also.

Above all, it is the personnel of the Department that makes or mars other efforts and methods. So, no pains should be spared to make them the proper sort.

The utility of forests in relation to the Agricultural and Industrial development of India.

Winning Essay for the 'Indian Forester Prize' for Present Students.

By, K. Krishnamoorthi, B. A., 1932–34 Dn.

Of all the gifts that nature has, with a bountiful hand, endowed India with, there is scarcely one that is as valuable, or one whose immense potentialities have been so little realised by the community at large as the forests. Forests—Nature's greatest gifts to any country, are of use to it both directly and indirectly.

The direct utility of forests lies chiefly in their produce and can be estimated at least approximately in terms of Rupees, annas, and pies, but nothing except the decrease in the rainfall, and consequent decrease in the fertility and value of the land, and the prosperity of the state, that follows their gradual disappearance, can give any idea of the immense influence that forests have on the destinies of the country.

To an essentially agricultural country like India, the indirect uses of a forest are of far greater importance than

their direct uses. So, it is only proper that all should consider the indirect benefits conferred by forests, first. The indirect uses of a forest are as follows :—1. Forests render the climate more equable, reducing extremes, increasing the relative humidity of the air, reducing evaporation of moisture and the radiation of heat from the ground. By exposing a large evaporating leaf surface, and thereby offering a large cooling area they increase precipitation of rain. 2. They regulate the water supply preventing sudden floods. By conserving the rain water they make the flow in the rivers more steady. 3. They increase the fertility of the soil, with their rich humus. 4. They reduce the velocity of air-currents and protect adjoining fields from cold and dry winds and afford shelter to game and cattle. 5. They increase the beauty of the country and " produce a healthy aesthetic influence on the population."

The direct benefits favouring the agricultural development of the country are many : 1. The forests supply green manure leaves to the agriculturists, and in some districts like South Kanara this is one of the common rights exercised in a forest. 2. They supply all the wood required by the agriculturist for making their agricultural implements to build their houses for making carts and for fuel. 3. They harbour birds that feed on insects that damage the field crops. 4. Lastly and most important of all, they afford ample, and in many cases the only available, grazing ground for cattle. The last question (that of grazing) is one in which the Forest department and its sister departments of Agriculture and Cooperative do not see eye to eye.

According to Messers Jattai and Beri, " a closer coordination than at present obtains between the Forest department and those departments like Agriculture and

Cooperative, which concern themselves directly with the question of promoting the welfare of the agriculturists, is desirable in order to reconcile the two conflicting points of view. Although the principal function of forestry is the preservation and development of forests we must never lose sight of the fact that it has also an important vocation as the hand maid of agriculture, because forests can supply many of the needs of the peasant such as firewood to replace manure used as fuel, small timber for houses, and wood for implements, as well as grazing and fodder for cattle, concessions to which the Indian farmer has been accustomed to for long centuries, and the sudden curtailment of which is resented by him as unduly harsh and arbitrary.

In order to enable agriculturists to take a more enlightened view of forest administration and to increase the utility of forests to them the Agricultural commission has recommended that each province should appoint a Forest Utilization Officer whose main function should be to develop forest industries, a matter of great importance to agriculturists especially those living in the neighbourhood of forests.

Having discussed forestry all too briefly in its role as 'the hand maid of agriculture' in India, let us now consider it in relation to the industrial development of the country.

Because of the number of industries that depend for their success on forest produce and because of the employment that it offers to a large number of people, forests play an important part in the economic and industrial development of the country.

There is a considerable number of Jungle people deriving sustenence directly from the products of the forests,

and there are large numbers of wood cutters, sawyers, carriers, cart men, and craftsmen etc., working in or near the forests. In addition to these there are the carpenters wheelwrights, boat builders, lac manufacturers, rope makers, tanners, and other artisans and workmen employed in the thousand and one industries that depend upon forest produce for their existence.

Coming now to the forest produce themselves, and the industries which they have given rise to, we are confronted with a bewildering variety of produce representing an equally large number of industries. The reason for this is that India by virtue of its great size and the presence of the Himalayas has an advantage possessed by few countries in the world.

It is not every country that has such varied type of forests. Forests there may be and probably greater in area than those of India but not a single country can boast of forests having such a wide variety of vegetation having a wonderful array of forest produce capable of catering to every kind of demand. Which other country can show such widely differing types of forests as the Teak forests of South India, the Sal forests of the Sub Himalayan, and Hindustan regions, the rain forests of the West Coast, the arid scrub of Rajaputana and Sind, and the coniferous forests of the lofty Himalayas?

As it is not possible to deal exhaustively with all these industries, I shall merely mention some of the more important industries that are capabale of further development. The following are some of the more important industries :—

Manufacture of (a) furniture (b) plywood and veneers, (c) sporting requisites, (d) small fancy articles like toys

candle sticks etc., (e) mathematical instruments, (f) packing cases, tea boxes etc. (g) safety matches, (h) lead pencils, (i) paper.

Distillation of oil from Sandal wood, Eucalyptus, Lemon grass, Rusa grass, etc., and ethereal oils from the flowers or leaves of certain forest trees for the manufacturing of scents and perfumes on a commercial scale; extraction of wood oil from *Hardwickia pinnata (Kingiodendrom pinnatum)*; extraction of turpentine and rosin from pine (*Pinus longifolia*); extraction of Gurjun oil from *Dipterocarpus sp.*; cultivation of lac, charcoal manufacture, 'Beedy' manufacture; manufacture of tannin extracts and dyes, kath and cutch, etc.

Most of the above mentioned industries have all been tried though not on a commercial scale. The manufacture of *ply wood and veneers* has been till recently only in an experimental stage and now that it has heen proved that there are some Indian timbers that make excellent ply wood and veneer that industry is sure to develop. *Terminalia crenulata* and *Calophyllum sp.* are two of the best known timbers suitable for the purpose. *Sporting requisites* is one of the industries that have developed rapidly within the last two decades. Most of the sporting requisites are made from one or other of the following woods: *Fraxinius floribunda*, (cricket stumps and hockey sticks), *Fraxinius excelsior*, the rent ash (Tennis racket frames), *Salix* sp. Cricket bats, *Morus* species (inferior stumps, tennis racket frames, etc) *Grewia tiliaefolia* (golf clubs) and *Dalbergia sissoo* (Indian clubs, horizontal, parallel, and trapeze bars. With plentiful supplies of these woods and proper management, the future of the industry is assured. Manufacture of *fancy articles and toys* is an industry that has not developed to the

extent it might have, due mostly to the flooding of the markets by cheap fancy articles and rubber and celluloid toys, the results of mass production. With such woods as *Wrightia tinctoria*, *Gmelina*, *Pterocarpus santalinus*, *Givotia rottleriformis* and Sandal, there is no reason why the industry should not develop with proper advertisement.

Mathematical instruments can be made from many of our woods belonging to *Rutacae* and *Rubiacae* which are practically equal to box wood in this respect. *Atalantia monophylla* and species of *Gardenia* are good examples.

Pencil manufacture is an industry of which very little is known. *Juniperus macropoda* found in the higher elevation of the Himalayas is said to be the wood *par excellence* for pencil manufacture but the difficulties of extraction have now prevented it from being used to any great extent. Other suitable woods are *Podocarpus Wallichiana*, *Pinus longifolia*, & *Wrightia* sp. Given a a fair chance this industry is sure to develop.

Distillation of *oil from Sandal wood*, from the Lemon and Rusa grasses and *Eucalyptus globulus* has been going on for some years, though not on a large scale. Distillation of oil from species of Eucalyptus other than *E. Globulus* may be of value if the oils are once distilled and analysed by chemists and experimented with. Oil from the leaves of *Gautheria fragrantissima* is worth extraction on a large scale.

Distillation of Scents from the flowers of forest species such as *Michelia* sp. and *Jasminium* sp., may become a flourishing industry if undertaken on a large scale.

Extraction of oil from the bole of *Distrocarpus indicus* and turpentine and Colophony from Pine has been carried out on a small scale in northern India. Few people outside Tinnevelly and South Kanara districts know of the extraction of oleo-resin from the stem of *Hardwickia pinnata.* This is an industry capable of further development, as the oil can be used in place of varnish for rafters.

Lac cultivation was introduced only a few years ago into South India but even within this short time it has developed greatly and bids fair to be one of our largest industries. Shellac, sealing wax, and polish got from lac find a ready sale in the markets, which is another point in its favour, in these days of poor markets.

No other industry had such a rapid development as the '*Beedy*' (small cheroots) *industry.* It is now almost one of the cottage industries. The leaves of *Diospyros melanoxylon* are the ones most commonly used for the purpose. Huge quantities of these are sent every year from the Central Provinces, to all the 'Beedy' manufacturing centres. Very little is known of the preparation of *Tannin products*, but it is sure to prove successful if properly managed as we have almost unlimited supplies of raw-material in the shape of various gall nuts, barks, "sumach" etc. *Dyes* have in the past been extracted from various articles of minor forest produce and used for dyeing silk, cotton, calico, and leather; but the cheap synthetic dyes from Germany have crowded the indigenous stuff from the markets. *Sericulture* has strong claims to be included among the forest industries as there are many species of silk worms (non-mulbery feeding worms) that live in the forests, and produce good silk. *Charcoal manufacture* is too well known to need any comment and is one of the successful forest industries of India.

The above are some of the more important forest industries. The raw materials required for most of these are available in plenty and if the lines of extraction for these and their transport to the place of manufacture be made easier many of the industries can cut down their cost of production by 50% or more.

The proper development of any industry whether 'forest' or otherwise is dependent primarily on the following things: (a) demand for the produce (b) an abundance of the raw material (c) cheap and plentiful labour (d) facility of transport of the raw material from the forest to the place of manufacture and thence to the markets (e) thorough technical knowledge and business acumen on the part of the management and (f) last but not least, sufficient capital for the production of large quantities of the material at a lesser cost. It is only recently that Japan and Germany have demonstrated to us the wonderful advantages of mass production.

Even if all the above conditions are satisfied the industry may not prosper if it is not properly advertised. This can be very well seen in the case of the furniture industry. The best way of advertisement will be to exhibit furniture made of some of our lesser known but none the less beautiful woods in exhibitions (as a result of the Indian exhibits in the British Empire Exhibition a demand has been created for some of our Indian timbers). This would be easier if the Government makes furniture in the factories and sells it to the public. Seeing that it is only the Government that is able to grow timber fit for furniture, it is strange that there are no Government factories making furniture. By so doing not only will the quality of the furniture made be better but, the public will incidentally come to know the value of some of our

lesser known furniture woods. This may be objected to on the ground that it is not the policy of the Government to compete against private enterprise; but the fact is that it is, really not necessary to compete with private enterprise in order to show the way. Where the state takes the lead private enterprise will not be slow to follow, and then the whole thing can safely be left to their hands once our object of educating the public and creating a demand for our produce has been accomplished.

We have seen how rich India is in natural resources. These have only to be properly developed, for the various industries to become veritable gold mines, and with proper management there is no reason why the forest produce of India should not become the " big noise " in the industrial world.

EXTRACTS.

1. India's Tea Chests :

The Problem of Home Manufacture.

Five-ninths of the boxes required in the Indian tea trade are still imported from Europe according to Capital Indian Industries Supplement quoted by the *Indian Forester.* In the early days of manufacture all tea-boxes were made locally on or near the garden from *simul* or other softwood timbers, and, as the industry grew, supplies were supplemented by plank boxes from Japan, the best known being the "Momi" box. Because these local boxes were made from unseasoned wood, the shooks merely being sun-dried, a heavy, and, therefore expensive four-ounce lead lining had to be used to guard against taint from the unseasoned wood. Local mills have since been closed or have disappeared because of the demand for the more popular and more economical three-ply box with its easier handling and very light lead or aluminium lining.

During the war the tea industry had to get its supplies from the Continent, considerable difficulty being experienced in meeting the demands of the industry, and in 1917 the Surma Valley Sawmills, which were then manufacturing country shook plank boxes, undertook the manufacture of three-ply boxes. This venture was not a success partly owing to the difficulty of obtaining, under war conditions, suitable raw material for the class of cement required and partly to the lack of suitable timber in sufficient quantities. This company was the pioneer of ply-wood manufacture in India, and experience soon showed that, although most timber will veneer, not all timbers are suitable for boxes.

Two years later the Assam Sawmills and Timber Co., Ltd., was floated with its six saw mills manufacturing country shook boxes, and it was granted a 30 year lease for the extraction of timber from the North-East Frontier tracts provided it erected an up-to date veneer factory within two years. The undertaking was achieved, a huge factory being built at Murkong Selek. Difficulties at first were great, and the undergrowth in this Assam forest was so thick that even an elephant could only push its way through at a pace of one mile an hour. The company for several years passed through an anxious time. Gradually each of its six mills was closed due to the disappearance of the demand for the old-fashioned country shook-box, and to-day the veneer mill only remains working and sells its

out-turn, in increasing quantities, to most of the leading tea firms in Calcutta and London.

In 1924 another veneer factory was installed, a plant having been erected by the Assam Railway and Trading Co., at Margherita, on the Dibru-Sadiya Railway, and this is working at the present time.

Although these two remaining factories compete in price with the imported chest, neither factory finds it easy to sell its full out-turn owing, it is stated, to the many vested interests in foreign boxes. At least eight different boxes are being imported from Europe, all of which are marketed by firms interested in tea.

" It is correct to say," goes on the report, " that in normal times 30 lakh chests are required by gardens in Northern India, and that factories manufacturing in the heart of the tea-gardens find it difficult to dispose of five lakhs. It is a matter of opinion whether those responsible for packing this enormous tea-crop are wise in relying upon European shippers for packing and dispatching their very valuable produce, and it would seem a short sighted policy not to support this local box industry to the full with the object of encouraging other companies to manufacture boxes in different parts of Assam until at least 50 per cent of the trade's requirements could be bought locally."

" The raw material is available in India, and that India can produce a sound economical veneer tea-box has been proved in practice over a period of years, and that the Indian three-ply box is a good one is also proved by the fact that the sales of the indigenous chests are slowly rising. In Europe, in such countries as Russia, Finland, Austria and Jugoslavia, there are many veneer factories manufacturing plywood boards, not for tea-boxes but for panelling, furniture and all sorts of building work. Large panels are made up to 6 ft. × 6 ft., and in the course of manufacture, there are millions of small panels automatically outturned, not large enough for the general trade but admirably suited for tea-boxes. Tea-box panels, therefore, can be classed as waste or by-products of these factories, and so can be dumped very cheaply into India," states the writer of the report.

" India can produce tea-boxes almost entirely of Indian materials. In fact, everything that forms part of a tea-box can be procured in India with the exception of tin for the manufacture of tinplate for the fittings and a few alkalies for the manufacture of cement. It is the policy of most countries of the

world to-day to buy their requirements from within the country rather than from without. If the tea-box industry was correctly supported," he concludes, "hundreds of unemployed in Assam would benefit, large sums of money would remain in India to the advantage of India, and in the event of a world crisis, tea-gardens would be assured to being able to pack their crop."

— *The Timber Trades Journal, 26–5–34.*

2. Germination of Seeds :

By, Sir Arthur W. Hill, K.C.M.G., F.R.S.

The ovule, which later bocomes the seed, is enclosed in the fruit vessel or ovary, the covering provided by the mother plant. During its development, the offspring is protected and nourished by its mother, and the ovule gradually develops into the seed, with its own protective skins or coats, lying within the enlarged ovary, which in the course of time has become the fruit.

Examples of fruits with their contained seeds are such familiar objects as the fleshy-fruited tomato with its dry, flat seeds, the broad bean or the scarlet runner with the enclosed seeds or beans, and the Brazil nut, where the mother plant has provided a thick, woody, cannon-ball-like protective fruit—which can only be broken by a powerful hammer or cut across with a saw—enclosing the well-known hard-shelled 'nuts'.

Many seeds have been so well protected by the mother plant that the liberation of the seeds contained in the fruit is often a matter of some difficulty. The Brazil nut fruit is perhaps the most remarkable example. In other cases, however, the seeds are shed or scattered from the fruits with the greatest ease when the fruit is ripe, as any gardener knows only too well who attempts to save seed of an *Impatiens* (balsam), or collect the seeds of gorse, which are shot out from the fruit as if from a catapult. The horticulturist, of course, is concerned only with the seeds when he wishes to replenish his stock of plants. In the majority of cases he merely sows the seed, and germination, that is, the escape of the embryo from the protective seed-coats, takes place sometimes in a few days, sometimes after some weeks from sowing. In the case of willows and poplars the seed will germinate the day after it is sown, and if the minute seed should be kept for more than a few days it will completely lose its power of germination. In other cases seeds may remain viable for years. I remember well the late Sir Michael Foster showing me a pot of *Iris*, in which the seed was just beginning to germinate fourteen years after it had been

sown! Then there are the seeds of the Australian wattles (acacias), which rarely germinate until a fire has passed over the ground in which they are lying, or which, if sown at home, have to be scraped with a file, or treated with strong sulphuric acid, as is also the case with some other seeds, in order to induce germination, so strong and resistant is the seed-coat. It is known that seeds of *Acacia lophantha* will germinate after being stored for sixty-eight years and recently, in connexion with inquiries as to seed vitality, we have experimented at Kew with seeds long stored in bottles in our Museum and have successfully germinated seeds of *Anthyllis vulneraria* and *Trifolium striatum* both ninety years old, and seeds of four other leguminous plants, including the Spanish broom (*Cytisus scoparius*), all eighty-one years old.

How long the poppy seed, which germinated and flowered so wonderfully after the shelling of the Somme battlefield, had lain buried in the soil, or how long charlock seed will remain living when buried, we do not really know; but it is truly remarkable that life can persist for so long a time in a body so minute as the embryo of a seed imprisoned within its seed-coats, when the seed is preserved under suitable conditions. What the nature of such life may be, and to what extent respiration, and the other functions we associate with living matter, may be carried on in dormant seeds, is scarcely within the scope of my text, nor could I throw much light on this arresting problem. For the moment we are concerned with the embryo prisoner, whether serving only a brief or a long sentence of confinement, and the nature of the prison.

There is a minute orifice in the seed, the micropyle, originally the point of entry of the pollen tube into the ovule, behind which ultimately the radicle or root tip of the embryo will lie in the mature seed. Through this minute and well-sealed pore, and also by absorption through the coats, moisture enters the seed when conditions become favourable for germination, and the radicle emerges at the micropyle. In the case of most seeds it is safe and usually advisable to store them through the winter and sow them in the spring, since the embryo is in the resting or dormant condition, whatever that may signify. There are, however, a few seeds which do not undergo any resting stage, bur development is continuous, and the embryo is in an advanced stage of germination when the seed is shed. The prisoner effects his escape, as an Irishman might say, before he has been shut up! Willow seeds, as I have mentioned, almost come within this class, but the mangrove, with its viviparous

seeds is a classic illustration. Here the seed in the inverted-pear-like fruit germinates while the fruit hangs on the trees. The long fusiform radicle grows downwards and eventually the young plant falls off into the water where it floats upright and gets carried to a safe landing in the mud of a tropical estuary. *Typhonodorum*, a giant aroid from Madagascar, behaves in a similar manner, and well-developed young plants, still attached to the large, bean-like seeds, are shed into the water where they float upright with the young leaves in the air.

In these cases, we might say that the embryo, realising how flimsy and insecure are its prison walls, considers it wiser to escape at once and so avoid the risk of being killed by insufficient protection, which might have happened should it have 'gone to sleep' for a period, like other embryos, after the maternal influences had ceased.

The normal seed consists of two close-fitting coats, the inner usually membranous, the outer being either papery, leathery or woody, and often ornamented with most beautiful surface markings, which cover and protect the embryo. The embryo may be embedded in food material on which it can draw when germination commences—the type known as albuminous —or it may have absorbed into itself, during its development, all the nutritive materials supplied by the mother plant and stored them for future use in its seed leaves or cotyledons—which is known as the exalbuminous seed. In either case germination, with the majority of seeds, is simple and straightforward: the emergence of the radicle, the splitting open of the seed-coats and the withdrawal of the cotyledons or seed leaves follows in due course. In a few cases, of which the vegetable marrow (*Cucurbita*) is a good example, the young seedling takes special care to free itself from its seed-coat and develops a special peg-like outgrowth at the apex of its young root which presses on the lower valve of the seed-coat, while the arch of the young stem carrying the cotyledons lifts up the upper valve and so effects its escape. The youthful prisoner thus puts its foot on the floor of its prison house and raises the roof with its bent shoulders.

The palms show certain peculiarities in the germination of their seeds, which are unlike those of other plants. I will take the familiar date stone (*Phœnix*) as my example. Dates are fleshy fruits with a hard horny-like stone in the centre, which is the seed. In the middle of one side of the seed there is a small circular umbilicus or navel behind which lies the embryo. Owing to the horny nature of the endosperm of the seed, it

would be well nigh impossible for the embryo to escape if the date attempted to germinate in the usual way, since the cotyledon and shoot apex could not get free from the seed, even though the root could grow out and push down into the ground. The problem is solved by the date, coco-nut, double coco-nut and other palms by transporting bodily the whole embryo out of the seed through the navel-like depression and burying it in the ground some distance below the surface of the soil. This is accomplished by the outgrowth of a closed germ-tube, the cotyledonary sheath, completely surrounding the embryo, which in the double coco-nut is a stout formidable looking article. Though the embryo has been taken out of the seed, however, and is being nourished by the supplies contained in the seed through the cotyledonary sheath or tube, the problem of its escape is not yet solved, since it is still a prisoner within its own tube-like sheath. It is as if the walls of its prison cell had become elastic and extensible and the cell had extruded itself through its window, carrying the embryo still imprisoned within the elongated cell; a procedure which may be compared to a person sliding down a tubular fire escape from a window.

The embryo, however, is able to solve the problem; for the young shoot with its seed leaf grows and forces its way through the wall of the germ tube and emerging into the air finally starts on an independent existence. This may take place in a fairly short time, but in the case of the double coco-nut several months elapse after the embryo is carried out of the seed before the young palm leaf of the seedling escapes into the daylight. The coco-nut and double coco-nut differ a little from the date in that the actual seed is enclosed in the innermost wall or endocarp of the fruit, and are thus similar to cases I am about to describe; otherwise the procedure is exactly like that exhibited by the date.

Turning now to those seeds which have an additional protection in the way of part of the fruit wall as well as their normal seed-coats, as in the coco-nut to which I have just referred, I may mention first the most simple cases of plums, cherries, almonds and olives. In these cases the edible flesh is part of the 'fruit' proper, but the stone is also a portion of the fruit wall, so that it is not strictly correct—botanically—to speak of plum or peach stone or coco-nuts as 'seeds', since the stone is a fruit structure and only the kernel is the actual seed.

The fruit wall or pericarp consists of three layers or coverings: the outer one which is the skin; the middle fleshy

and edible portion, the mesocarp; and the hard, innermost layer, the stone or endocarp, which encloses the seed or seeds. Stones or stony endocarps of this nature may contain one, two or several seeds.

Cherry or plum stones afford good examples of stony endocarps containing a single seed, and the embryo has not only to solve the problem of escaping from its seed-coats, but also the more difficult task of getting out of the woody box-like stone, which has to be cracked by hand should one wish to obtain the kernel.

Careful examination of a plum stone shows the endocarp to consist of two similar and closely-united halves, only separable when the plane of weakness becomes softened. The cells of the stone do not cross the line of junction of the two halves of the stone, but are turned at right angles at the median line and the two distinct halves are firmly 'cemented' together. The stone thus easily splits into its two halves, after sufficient moistening, by the pressure exerted by the emerging radicle or root tip of the embryo, and in due course the cotyledons or seed leaves, with the young shoot apex between them, are successfully drawn out from the seed coats enclosing stone, and expand in the air.

The walnut, *Juglans*, the shell of which again is a fruit structure, behaves much like the plum on germination, the shell splitting into its two component halves. Here, however, there is the difference that the shell is formed by the close adhesion of two carpels, each half of the shell being a separate entity.

We may now consider those seeds which on germination escape from their endocarps or stones by threwing off a specially-prepared portion only of `the endocarp wall. The best examples of such fruits, enclosing a single seed, are afforded by the tupelos *Nyssa* and by *Mastixia*, both belonging to the family Cornaceæ. The valve, which is thrown off germination, which may be compared to the shutter of a shop front, is about one-third the length of the stone, square-cut at the base, with a bluntly triangular apex. Until germination commences it is scarcely possible to see the outline of the valve, since the surface markings of the stone are continuous over the valve and the rest of the fruit. When germination commences and the substance cementing the valve to the rest of the endocarp is dissolved, the radicle pushes off the shutter, which becomes completely detached, and so the embryo effects its escape. It is of interest to notice that specimens of fossil seeds of *Nyssa* and

Mastixia, found in Eocene beds in the Isle of Wight and in Pliocene beds of the Dutch-Prussian frontier, show the valve structure perfectly. There is a further interest in these fossil seeds, since *Nyssa* to-day is only known in the eastern United States, the Himalayas and the Malayan Islands, and *Mastixia* in India and the East Indies.

The cornels, *Cornus*, have fruits of a similar character, but differ in having two seeds enclosed in an endocarp, which necessitates the splitting off of two shutters, one for each embryo, when germination commences. As in *Nyssa*, the shutter has a horizontal base, and before germination takes place the presence of the valves or shutters cannot be detected.

The fruit of *Canarium* (Burseraceæ) contains three seeds enclosed in a stony endocarp. The hard woody valves or shutters are triangular-ovate, pointed at the apex and horizantal at the base, and are about two thirds the length of the stone. On the inside they are concave. The seed cavity is the full length of the stone and the radicle of the embryo is at its broader upper end. On germination, the radicle pushes the shutter upwards and the arch of the hypocotyl raises the shutter still more. The embryo, however, is well surrounded by its seed-coats and in order to extract its cotyledons properly a peg like structure is developed at the apex of the radicle on the seed side, which grows over the lower edge of the stone much as in the vegetable marrow. The young seedling thus treads on the floor of its prison box, keeping it firmly on the soil, while the hypocotyl, exerting its full pressure, withdraws the cotyledons both from their own seed-coats and from their wooden, box-like prison.

The seeds of the teak tree (*Tectona grandis*, Verbenaceæ) show a similar arrangement of shutters. Here, however, there are four cavities in the endocarp and the four shutters extend nearly the whole length of the stone. When the shutters are thrown off on germination the destruction of the prison has been so complete that only the partition walls remain. *Saccoglottis* and *Aubrya* (Humiriaceæ) may be mentioned in passing, since in them five embryos may be incarcerated, each in its separate cell. They too escape by taking down the shutters.

Dravidia, another of the Cornaceæ, a remarkable Chinese tree introduced to cultivation a few years ago—which, when in flower, resembles a large wash of white pocket handkerchiefs hung out to dry—has the most complicated of the shutter devices for imprisoning or safeguarding the seeds. In this plant seven

or more seeds may be contained in each stony endocarp and, as they lie close together, only one seedling is likely to survive owing to overcrowding, since they cannot get away from their fellows. The protection for the embryos is admirable, but almost over-ingenious, since the object in view, the propagation of the species, is somewhat defeated when so many good seedlings must eventually perish. This almost suggests a 'slum' analogy! The hard stony endocarp of *Dravidia* is deeply fissured and when ripe no trace of the shutter-like valves can be seen The shutters, however, as a cross section shows, are all prepared and ready to be loosened when the opportunity comes: The shutters are similar to those already described—some two thirds the length of the stone, long, narrow and thick, and hollowed on the inside. On germination not only is the shutter thrown off, but also a portion of the endocarp wall or rib between each shutter is shed, and this portion, no doubt, serves to cement the seeds or ovules all the more securely and hermetically in their narrow cells. As I have already mentioned, however, many of the escaped prisoners die of starvation due to overcrowding, since they are unable to move away from the neighbourhood of their former prison.

I must now direct attention to a somewhat different method of imprisonment by means of cork-like stoppers and lids. The fruit of the mare's tail, *Hippuris*, a well-known British water plant, contains a single seed, and the endocarp, which in this case is not hard and stony, is shaped like an ovoid bottle and corked at the neck by a plug or stopper or hardened tissue. It may be compared to a test tube plugged with a stopper of cotton wool. On germination, the radicle of the embryo within the cavity or tube forces out the stopper, like the ejection of a champagne cork, and so effect its escape.

The large, woody, spherical fruits of *Northea seychellana* (Sapotaceæ) show a small circular area at one end, which proves to be a cap fitting into and closing an orifice, beneath which lies the radicle of the embryo. This cap is pushed off on germination and the shoot apex is pulled out into freedom through the orifice by the lengthening of the stalks of the cotyledons which, themselves, remain within the seed.

It is when we come to examine the fruits of various members of the Anacardiaccæ, the family to which the cashew nut, mango, pistachio nut and other edible fruits belong, that we find some remarkable contrivances for the protection of the seeds, and equally ingenious devices by which they make their escape on germination.

Hœmatostaphis, the blood plum of Nigeria, is an example of a stony endocarp with a lid containing a single seed. On removal of the flesh of the fruit a small lid-like structure can be seen at the apex of the stone, which forms a close-fitting stopper hermetically sealing the orifice of the cavity in the endocarp in which lies the embryo with its radicle directly under the lid. On germination the lid separates into two halves, like a pair of doors, which are pushed aside by the emerging radicle. Before germination there is no indication that the lid is a double structure which can be thrown open for the exit of a visitor, like front doors of a millionaire's mansion!

The Kaffir plum of South Africa, *Sclerocarya caffra* and *Dracontomelon* from the East show similar devices to *Hœmatostaphis*, except that in the former. three, and in the latter five, embryos are enclosed in each stony endocarp. The cavities containing the seeds or embryos are in each case closed with a cap-like lid, in shape like a circular military cap, some 3 mm. thick, hollowed out on the inner side and thinned out at the lower corner. This is the weak spot in the armature through which external moisture can enter when the fruits are sown, and it is also the spot at which the embryo makes its attempt at escape by pushing up the cap with its developing radicle.

During the War some fruits were picked up in the East end of London, after an air raid; they were sent by the Home Office to the Pharmaceutical Society for examination and thence to Kew for determination, as it was thought they had been dropped from an enemy aeroplane with sinister purpose, since they were succulent and edible. The fruits proved to be those *Dracontomelon sinense* and had no doubt been dropped by some sailor home from the East!

A yet more elaborate and complicated device remains to be described in this same family *Anacardiaceœ*, which has been evolved in the genus *Pleiogynium*, the Burdekin plum of Queensland, Australia. Here the seeds are not only enclosed in stony endocarps, but also to ensure more complete protection of the embryo, the middle portion of the fruit—the mesocarp—has become stony, and the stony endocarps are, in addition, surrounded and enclosed in an outer, woody box, like the proverbial pessimist who considers it essential to wear braces in addition to a belt! Here, again, the protection seems to have somewhat overshot the mark; for some twelve seeds are imprisoned in this outer turbinate woody box (2.8 cm. in diameter), and ultimately, on germination, only one of the seedlings is likely to survive in the competition with its close neighbours.

Each stony endocarp in this enclosing box has a lower tubular portion more or less fused with the tissues of the mesocarp, and an upper cap-like portion firmly cemented to the lower part, which becomes detached on germination and is pushed through the orifice in the mesocarp so that the embryo can emerge. The caps are somewhat similar to those of *Sclerocarpa* and *Dracontomelon,* but they are triangular in section and hollowed within to contain the upper part of the embryo. In shape they resemble a French forage cap.

The extreme case of wastage of effort is that of the Brazil nut, *Bertholletia.* When you purchase Brazil nuts, you rarely if ever, see the fruit body in which they are contained. The well-known 'nuts' are the seeds with their strong, woody seed-coat; but they are contained in a large, woody, spherical fruit some six inches in diameter, with a wall half-an-inch thick and as hard as well-seasoned oak, with a smooth, glass-like inner layer. At one end of the ball there is a small orifice firmly plugged by a stopper, and inside the 15–20 seeds are so neatly packed, with there thin edges inwards, that the hollow wooden sphere is completely filled, and no space is wasted. When conditions are favourable for germination, the seeds inside all commence to germinate at once. The orifice, half-an-inch across, however, is their only means of escape, as the fruit wall remains hard and intact. The result may be compared with the rush of a crowd on the call of "Fire" at a theatre. Everyone tries to get out at once and only one out of the 15–20 prisoners survives! Surely this is a case where the means have defeated the end.

Why should some seeds, like those of many orchids and lilies, papery in their texture and almost transparent, survive perfectly well in a dormant condition for a long period, while others need a strong protective envelope?

All these questions relating to the nature of the life in a dormant seed, whether germination may be immediate or may be long delayed, and the ingenious methods of germination, afford problems of much interest; all the more so since they are so illusive and because our attempts to solve them are confronted by so many difficulties.

— *Nature, 16-6-34.*

3. Pollen constancy of Bees :

Several authorities have supposed that hive bees do not gather honey from more than one species of plant at the same time, but this is not always the case. Whilst bees of the species

Apis mellifica obtained pollen from one species in 56% of their loads, the remaining loads were mixed, and in a few cases pollen from four different species was found. Bees belonging to the genera *Andrena* and *Halictus* have a lower degree of constancy than the hive bee. It appears that insects which occur most commonly on apple blossoms have also a wide range of other pollen hosts.

— *Nature, 7–7–34.*

4. Pruning of the Tea Plant:

* * * The main consideration of the grower in connection with the practice of pruning has to be its effect upon flower and fruit production, but in the case of the tea plant the aim has usually to be to force a large number of buds into vigorous vegetative growth from which a crop of young leafy shoots may be gathered. Naturally this treatment means a great reduction in the carbohydrate reserves in the plant, and the result is often a very serious 'die-back' of the branch system of the bush. The plant physiologist in Ceylon describes the results to date of the trial of a method of cutting back the bushes in which six main outer branches (the 'lungs') are left until about a month before the time of tipping, when they also are cut back to just above a bud. Such vigorous leafy shoots are thus able to contribute to the carbohydrate reserves of the bush before they are removed, and the result has been a considerable increase in the yield of shoots suitable for tipping, and a reduction in 'die-back'. This last point is very important, as the withering snags are often places where disease organisms first obtain access. This priliminary report upon the experiments of the Institute is much in favour of the new practice which is termed 'rim-lung' pruning. * * *

— *Nature, 4–8–34.*

5. Extracts from "Notes and hints on the collection and treatment of cardamoms in the Silent Valley, based on 1933 experience."

By, Abdul Hamid Khan I. F. S.

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1. *Locality of production and the future yield.*

Cardamoms occur throughout the evergreen forests of the Silent Valley. They are best suited to a rich loamy soil on an undulating ground, and tend to be gregarious where the middle

storey is sparse and plenty of diffused light can enter through the top canopy. The gaps created by the selection fellings in the Silent Valley coupes are readily invaded by them, if the soil conditions are favourable and mother plant exist nearby. It is on account of these gaps that the production of cardamoms has of recent years increased considerably in the Silent Valley.

In the second year of felling the plants shoot up on all sides of the favourable gaps. They begin to yield a light crop in the third year, a partial or full harvest in the fourth year after which full crops are produced.

2. Season of harvesting.

The right time to commence harvesting is, the first week of August when the seeds in the fruit begin to turn dark in colour. The harvesting season lasts till the middle of October, most of the crop being collected during August and September. The cardamoms collected from the middle of September onwards were smaller in size than those collected during August and earlier part of September.

3. Protection of the crop during the harvesting season and before.

It is very important that the crop be protected against theft from the first of July till the completion of the collection.

4. Method of collection.

The collection in the forest is a simple affair. Coolies experienced in the collection of cardamoms are available in plenty. The harvesting consists of pulling out the whole panicle of fruits. This practice is wasteful, but cannot be helped, as a discriminate picking of the ripe fruits individually, as practised in the estates, would be too expensive to adopt over an extensive area of forest. But a discriminate plucking of panicles at least, is possible and should be insisted upon. Usually the cardamom plant throws out from its base 3 to 4 scapes which are in different stages of ripening at one time. It should be seen that the coolies do not pluck the whole lot in the very first visit but restrict their collection to only the ripe branches. A panicle fit for collection should bear at least 75% ripe fruits. The coolies are expected to hand over their collection to the Forester in the forest after removing the fruits from the rachis roughly. As the payment is made by paras which is a volume measure, the coolies are interested in removing the fruits with as much of the main stalk as possible. The Forester in charge of the collection should see that nothing beyond the

pedicel (the direct stalk of the fruit) is included in the collection when presented for measurement.

5. *Organisation and control of labour.*

The total number of coolies will be regulated so as to supply daily collection of not more than 60 paras which is according the capacity of the drying shed at Mannarghat. It is better to be on the safe side and begin with only about 25 coolies increasing the number according to the progress of drying at Mannarghat.

It is essential that there should be some check on the bona-fides of the collecting coolies in the forests, so that a thief when caught may not say that he is collecting for :overnment. A good method will be to have numbered zinc plates impressed with Range Officer's hammer mark which may be issued to the coolies in the morning and collected in the evening.

6. *Rates of collection.*

This year a rate of 0–6–0 a *para* for delivery in the forest was paid except that 36½ *paras* in October had to be paid at 0–7–0 a *para*. I feel that this rate, though cheaper that the contıactor's rate last year was perhaps a bit liberal, as the crop being good and concentrated, it was not unusual for experienced coolies to collect 1½ to 2 paras a day.

7. *Transport of the collected cardamoms to Mannarghat.*

Green cardamoms can stay two days rough storing in the hills and a day in transport without any appreciable deterioration in quality. But it will be safer to send the collection to Mannarghat the next day. All transport from the forest should be under invoices.

8. *Rate of transport.*

A rate of 0–3–0 a para from Neelikkal and 3½ annas a para from Chembotti and Aruvamparai was paid this year.

9. *Curing at Mannarghat.*

On receipt at Mannarghat an intensive cleaning of the green cardamoms is done by nipping off the stalk from individual capsules neatly. Women, girls and boys flock in plenty for the work and are paid at the rate of 0–2–6 per para of cleaned capsules.

The cardamoms after the stalk is removed should be spread evenly on the floor and not heaped up. It may happen at times that a fresh consignment of cardamoms arrives from the hills

but the cardamoms in the shed are not expected to dry for another day. In a case like this, it is better to store the green cardamoms with the stalk in-tact evenly spread on the floor rather than hurry the removal of the stalk. This ensures a better circulation of the air than the compact heap obtained after nipping off the stalk. As far as possible, it should be aimed at that the 'picked' cardamoms go to the drying shed the same day.

10. Drying Shed.

Briefly, the drying shed is a thatched building with bamboo thatti wallings made air tight by mud plastering. The roof is also ceiled with bamboo thatties but not mud plastered to allow the vapour to escape. The drying room is 30′ × 15′ which is divided into two vertical chambers by a strong lattice work at 6′ from the floor. Two iron furnaces 4′ × 2′ × 3′ are placed diagonally opposite from each of which a smoke-tight zinc pipe 9″ in diameter runs throughout the length of the shed and getting out at the extreme end sideways as flue pipe. Thus in the lower chamber, we have two parallel zinc pipes conducting heat from their respective furnaces, and at the same time finally letting out smoke at their far end.

11. Method of drying.

The green cardamoms picked off the stalk are spread evenly on the floor, and on mats on the lattice layer, the grains touching each other. 50 paras of 'picked' cardamoms can thus be spread at a time. The furnaces are fed by thick green fuel and the doors of the shed closed. Care should be taken that there is no leak in the pipes as smoke spoils the colour. It takes about 30 hours for the cardamoms to dry completely if care is taken to feed the furnaces constantly. The cardamoms in the upper chamber dry 4 to 6 hours earlier than the lower one. The cardamoms near the furnaces on the floor and directly above them on the lattice layer dry quicker. It is essential that the cardamoms be removed from the shed immediately after drying completely as they lose colour if allowed to remain afterwards in the heat. It shouid be remembered that it is chiefly the colour which commands the market. The whole secret of getting the right colour is to put the green cardamoms in the drying shed as quick as possible after collection in the forest.

I have said above that the capacity of the shed is 50 paras of cardamoms picked off the stalk. This is equal to 70 paras of rough cardamoms as received from the hills. It takes 24 to 30 hours to dry a consignment of cardamom in the drying shed,

Thus, a daily supply of about 60 paras from the hills will be according to the capacity of the shed. In practice this arrangemont won't work mathematically correct, but no serious dislocation is feared.

Sun drying is cheaper, but the price obtained for this quality is considerably lower than the good kiln dried quality, and the extra money spent on kiln drying pays much more in better prices obtained.

12. Cost of artificial drying.

About two cart loads of green fuel at Re. 1/- per cart load are required to dry one consignment of 50 paras of green cardamoms yielding about 115 lbs. of dried cardamoms. Two coolies at 0–3–0 each are required to feed the furnaces day and night. Thus the cost of drying excluding the repairs to the drying shed etc., works out only to about 4 pies per pound of dried cardamom.

13. Cleaning and storing.

As soon as the cardamoms are dried, they should be removed to the store-room where they are first rubbed on a wide meshed sieve to sieve off the small shrivelled unripe fruits and other rubbish, and then winnowed to further separate the grainless shrivelled fruits. The dried cardamoms then should be immediately weighed and packed in good double gunnies which are available locally at 0–3–0 each. The dried cardamoms should on no account be left heaped up in the store-room as in wet weather, they soon swell up absorbing moisture, and get mildewed if packed in gunnies in this condition.

14. Deficits in various stages.

Deficit occurs in two stages, firstly when the capsules are picked off the stalk and secondly after drying.

A *para* (10 *Narayams*) of green cardamoms picked off the stalks yields about 7 to 8 *Narayams* depending on the quantity of stalk removed. The yield this year has, though, varied from 6½ to 8½ *Narayams*, but in most cases it remained fairly constant between 7 to 8 *Narayams*. In weight one *para* of rough cardamom received from the hills is 25 lbs. and reduces itself to 18 lbs. after the stalk is picked off. But the weight is very much variable with different consignments.

One *para* of a good collection of finally 'picked' cardamoms, when dried, weighs 2 lbs. 12 tolas after cleaning, though bad collection of unripe fruits has weighed as low as 2 lbs. and

fully ripe fruits as high as 2 lbs. 21 tolas. 2 lbs. 10 tolas of cleaned cardamoms for every *para* of green picked off the stalk would be quite normal to expect on an average for the season, provided care is taken that unripe fruits are not collected in the hills.

The above figures are arrived at after sample experimenting with different consignments of cardamoms. Form 4 to 6 figures for 1933 won't give a correct idea of deficits as in the beginning about 350 paras of green cardamoms rotted for lack of any drying facility and some of it had to be beaten out for seeds. Further error crept in as different consignments after drying could not be weighed separately and the depot keeper (a Forest guard) foolishly noted the weights only approximately in form 4.

It may be asked why the account of the green cardamoms is kept in volume and of dried ones in weight and why a uniform measure is not adopted. The reason is that besides the impracticability of making payments for collection on weight in the hills, the weight in the green stage does not remain constant as it is influenced by such factors as rain and different degrees of ripening, and the checking on receipt at Mannarghat becomes impossible.

15. *Book Keeping.*

Accounting in forms 4, 5 and 6 as practised this year worked satisfactorily except that some difficulty was felt in bringing to stock correctly the dried finished products against respective consignments of the green products. By regulating the collection in the hills to the capacity of the drying shed at Mannarghat and by working the drying shed systematically, it would be possible in future to bring to stock the dried product correctly against the consignments issued for drying. The weights of the dried cardamoms should be checked by the Range Officer himself and the gunnies of 75 lbs. each sealed with his personal hammer mark.

16. *Staff.*

The existing Range staff is quite enough to carry out the departmental collection of cardamoms. During the month of August and September when there is rush of cardamoms, it will be essential to give an assistant to the Range clerk.

17. *Outturn and prices.*

This year out of a total output of 2437 lbs. of dried cardamoms, 2075 lbs. were sold through Peirce Leslie & Co., Calicut in the month of September 1933 at 0-11-0 a pound F. O. R.

Olavakkot less their selling commission at 2%. 91 lbs. of seeds obtained from the damaged cardamoms were sold through the same firm at Re. 1 per lb. The balance stock of 362 lbs. was sold at 0–10–0 a lb to a local dealer in December 33. The rate of 0–11–0 a lb. though quite good, considering the exceptionally dull market, was much below expectations.

This year we relied entirely on Peirce Leslie & Co., who did their best to find the best price. But the Calicut market quotations are always much lower than Coimbatore and Madras. Next year, perhaps, it will be a good thing to get the Forest Utilization Officer interested in our Cardamoms and send samples to him also to try the Madras Market.

Abstract of Revenue and expenditure during 1933.

	Rs. A. P.
I. Revenue.	
By sale of cardamoms 2075 lbs. @ 11 as. ...	1426—9—0
" " 362 lbs. @ 10 as. ...	226—4—0
" seeds 91 lbs. @ Re. 1 ...	91 0 0
Total Rs. ...	1743–13—0
II. Expenditure.	
(a) Collection of cardamoms in the hills ...	597–13—0
(b) Transport from the hills to Mannarghat.	347—8—0
(c) Picking of the capsule at Mannarghat ...	195–12—0
* (d) Cost of construction of drying shed ...	288—1—3
(e) Miscellaneous, such as purchase of fuel etc.	79—2—6
Total Rs. ...	1508—4—9
III. Net Profit ...	Rs. 235—8—3

** Note :—*

The shed is expected to last at least for 5 years. Hence only 1/5 of the amount spent on its construction viz., Rs. 58-0-0 should be charged for its use during the year. Hence the net profit is Rs. 235—8—3 plus

230—0—0 (1/5 of the cost of construction of the shed).

465—8—3

6

6. Wood Wool Matting :

Manufacturing a New Packing Material.

Recently a new packing material has come forward in the form of wood fibre blanketing or matting, being made in the same way as wood wool, utilising waste timber. The wood shavings are cut by special machinery in the long straight shaving and not curled, as is general with wood wool.

The machinery for manufacturing the matting is a wide feeding machine which presses the shavings flat and behind the feeding machine as the compressed shavings pass through the feeding and pressing rollers and behind these rollers operate high speed sewing or threading machinery, which sews together the matting at intervals of 8 in., which distance is adjustable according to the width of the mat. The stitch is interlocking and the matting may be severed from the roll without its becoming unravelled. Plain or tarred or waxed twine is used according to the use of the finished product. The matting can be sold plain, or dyed with basic colours, and is produced cheaply. It is extremely well adapted for many purposes.

Wood matting is used for packing machinery, for the making of jackets for oxygen and gas cylinders, insulating of ice boxes and refrigerating rooms. It is also constructed into jackets for glass carboys containing acid, and is also used in the transport of and the storage of fruit, as protection for herbaceous borders, also numerous further purposes.

— *Timber Trades Journal, 16–6–34.*

7. The Forests of Kenya :

The annual report of the Forest Department of the Protectorate and Colony of Kenya up to December 31, 1932 reflects the present position of most of the forest departments of the Protectorates and Colonies under the Colonial Office. The report opens with the sentence, " The world-wide economic depression continued to affect the Colony and to an even more serious extent than in the previous year, with the result that revenue continued to decrease and further economies became essential ". It is of course unavoidable that the heads of the forest departments should concern themselves primarily, even at the expense of professional practice, with the revenue receipts from the forests under their charge. For it is apparent that certain of the governors and their advisers are only able to envisage the forests and a forest policy from the point of view

of the monetary return that can be extracted from the forest estate.

As is well known, in countries in Europe where a forest policy and forest administration have for long been working hand in hand, those responsible for the professional management of the forests assume that revenue shall exceed expenditure, and that the department shall be one of the revenue resources of the State. In the case of ill-developed areas of forest with considerable potential possibilities, the effort to obtain revenue at the expense of real efficiency is, in the long run, inevitably disastrous.

Kenya is not the only Colony which is now suffering from a similar policy. In the immediate post-War years (if we omit the pre-War period and possibility of development in some Colonies) a broad forest policy coupled with a bold expenditure devoted to enumerations of the growing stock of unexplored forest areas and opening out the most accessible ones, would have assuredly placed the various forest departments on a sounder basis, and have enabled them to withstand better the depression of the last few years. The vacillating policy adopted left the departments in the most cases undermanned and weak, with the result that they have suffered probably to a greater degree from the severe cuts in establishment and so forth which have been their lot during the past few years—an action which will delay the development of the valuable forest estates under their control, and the subsequent revenue to be derived from these estates, by a decade. This being the position of affairs, it is not surprising to find the Conservator of Forests of Kenya devoting the opening paragraphs of his report to the financial position of his Department.

The Kenya forests are probably, in the interests of the economic development of the Colony, of so great a value that the statement that expenditure was reduced to £31,691 as compared with £39,237 in the previous year and that the cash revenue was £26,156, showing a deficit of £5,353, appears of trivial importance; when the far graver issues dependent upon the maintenance and correct management of this valuable property are taken into consideration.

It seems clear from the report that the drop in timber sales is only a temporary matter and that the normal requirements of the Colony will in due course witness a rise.

Owing to shortage of staff and the orders to economise, the area replanted, although said to be equal to the area felled

during the year, showed a decrease on the preceding year's acreage, being 3,892 acres as against 4,756 acres in 1931 and 4,429 acres in 1930.

In spite of troubles brought about by irregular rainfall and locusts—the Colony has experienced bad invasions of this pest for several years past—it was estimated at the end of the year that 73 per cent of the area planted was completely established, 26 per cent was fair and 1 per cent only had failed—a record sufficient to satisfy the most ardent planter. Improved organisation and increased economy of working is shown in this planting work, the average cost falling from 8·86s. to 7·13s.; this figure includes the cost of work in 1931 in preparation for the 1932 planting but does not include supervision or nursery costs.

The Conservator appears to be concerned with the timber being cut in the small forests still existing on private land which "was often sold for anything it would fetch and had a most demoralising effect on the timber market". In the early days in India, when Sir Dietrich Brandis was introducing a forest management and selecting reserves, he regarded the felling of timber on the private estate as assisting in providing for market requirements. His view was that these operations were an assistance to the State since it allowed the forest officer time to consolidate his selected areas of forest and to introduce an effective system of management. But at the time, it was recognised that some forest divisions or conservators' charges could not be expected to yield a revenue until effective organisation had been introduced, and the cheap material on private lands had been exploited and had disappeared.

— *Nature, 28-7-34.*

8. Grading of Empire Hardwoods:

A small brochure has been prepared by the Imperial Institute Advisory Committee on Timbers entitled "Grading Rules and standard sizes for Empire Hardwoods". The Sub-Committee, appointed by the Advisory Committee, decided that these inquiries should be confined to overseas Empire square-edged hardwoods. The grading rules and memorandum on sizes recommended by it will be subject to amendment from time to time, as further experience is gained. The grading rules for Empire hardwoods (square-edged) intended for shipment to the United Kingdom are considered under: A. Hardwoods from Countries other than Canada and New Zealand, I Standard Grades. II Wormy Grades. III Grades for shorts, squares, strips, quarter-sawn

stock. B. Canadian Hardwoods. C. New Zealand Hardwoods; and appendixes. This piece of work was overdue and should prove of great value to all concerned in this matter of hardwood imports. The danger of laying down hard and fast grading rules for any particular item of imports may result, however, in great waste at the source of origin—a waste which has to be seen on the spot to be fully realised. For example, under "Squares" it is stated, "*First Quality or Prime Squares* must be free from all defects, except that, when squares are sold specifically for turning, slight defects on one or more corners which will turn off will be admitted". In the case of mahogany, to obtain the flawless squares, sections of logs of 2–4 ft. will be cut off and left to waste in the forest owing to some small flaw which the manager on the spot will not risk sending home since he will be censured by the management. The latter will not have this type of material sent home since they know it will be objected to by the buyers. Is it necessary to waste annually thousands of cubic feet of so magnificent a timber as mahogany because the specification of import laid down by the purchaser approaches an ideal?

— *Nature, 18–8–34.*

9. The Lightest Wood:

According to recent reports, a wood has been found in Dutch India even lighter than balsa, which was hitherto thought to be the lightest wood, being lighter than cork. The new record of lightness is held by the roots of a tree with the botanical name *Alstonia spathulata*, which penetrate into the earth to a depth of 10 metres and are dug out with difficulty. The wood is yellowish-white and, in places of strain, looks like ivory. It can be compressed to a tenth of its contents, and, when the strain is over, it will expand again to a fourth of its volume, while in water it will regain its original size.

The wood is being used for the manufacture of helmets for the tropics, and, like cork, is also suitable for the manufacture of life-preservers and as packing and insulating material.

10. Food from Wood:

It gives us no satisfaction to contemplate the time which seems to be arriving when our breakfast will consist of pieces of wood. Such, however, are the possibilities of science that glucose is now to be extracted from wood, and a fundamental factor in all food products may, therefore, be available in much larger quantities, states *The Independent*. The responsibility

for this discovery belongs to a well-known English chemist, Dr. W. R. Ormandy; and history is repeating itself, for Dr. Ormandy has gone to Germany, joined up with a German scientist, and started a factory to exploit his discovery.

Apart from its scientific interest, Dr. Ormandy's work also illustrates the folly of a policy of self-sufficiency, such as we are endeavouring to follow. If the Germans find a new and almost inexhaustible food supply, the price of the food of the rest of the world will come down and the world will have more to eat at the moment when we are making all sorts of complicated arrangements to feed ourselves and pay more for it.

11. Wood Doors Frustrate Fire :

Method of Fireproofing.

Fireproof doors, it is stated, are making great strides in the United States in replacing steel and other fire-resisting doors. Steel, as is known, is a rapid conductor of heat and cold, while wood is, of course, very slow or non-conductiug.

By tests it has been found that wood is superior to steel in doors for actual fire-prevention. Steel doors heat through, get hot very rapidly and will cause fire to break out in adjoining rooms even though they are closed; wood does not heat through enough to cause this.

A big veneered door manufacturing concern in the Middle West have a complete plant for fire-proofing wood, and are manufacturing doors made of such wood, which meet the rigid requirements of New York City building code. The lumber is treated with chemicals which, when heated, give off a non-inflammable gas, protecting the wood.

All lumber to be treated is kiln-dried, then placed in a steel cylinder. Air is exhausted from the cylinder by vacuum, removing all moisture and foreign matter. The fire-proofing solution is then forced into the cylinder, and cells of the wood, which is kept under pressure until thoroughly impregnated. The material is then removed from the cylinder and air-dried two or three weeks, then kiln-dried.

— *Timber Trades Journal, 11–8–34.*

12. Hive-Bees do not necessarily Sacrifice their Lives when they Sting :

My scepticism regarding the frequent statement, for example, Bischoff, that worker bees (*Apis mellifica*) cannot withdraw

their barbed sting, and thus invariably die when they have stung, was first aroused by observing a raid by wasps, (*Vespa germanica*) on a hive in Essex, in September 1926.

In one case a wasp made a bold entrance by the doorway, was met by a bee and vigorously repulsed. It entered again, and emerged at once, struggling with a bee, which eventually succeeded in throwing it to the ground. The bee seemed somewhat exhausted; but it recovered completely. The wasp fell helpless, and died a few minutes later.

Experiments with bees showed that, when induced to sting a handkerchief, some of them, perhaps a third, finally get the sting into a position from which they cannot extricate it, the whole gland and vesicle tearing out in their struggles. But many penetrating stabs are followed by successful withdrawal.

Eight insects were killed by making hive-bees sting them. These were muscid maggots and flies, chiefly *Calliphora*, a small acridiid grasshopper, and an *Eristalis*. Some died in a few minutes. All were dead within twenty-two hours. A frog was stung several times, the frog hopping away on the occasion with the bee hanging by its sting. The bee succeeded in withdrawing and re-stowing it, and appeared none the worse. I was stung on the thumb, and perhaps because it was unexpected and I acted more violently than our other subjects, the sting was left in the wound. In all the other cases, however, even when the same bee stung several times, the bee recovered and re-stowed its sting none the worse. There thus seems little ground for the belief that worker bees sacrifice themselves when stinging other insects, or that they are any more handicapped than wasps in defending their nests from such enemies, or that they can sting only once.

J. G. MYERS.

— *Nature*, 25–8–34.

COLLEGE NOTES.

Foot-ball.

In the departure of the Seniors, the Foot-ball team has lost four good players; and the coming in of the Juniors has not filled up the void, as there are no good foot-ballers amongst them, except one. Despite this, we played the first match of the year—a friendly one—against the Coimbatore Government College Team perhaps, the strongest of all the local colleges and schools. Though we lost the match by the odd goal in 5, yet it is creditable to note that we put up a strong fight and scored two goals. Junior student, T. Abraham acquited himself splendidly in the centre half.

The Senior division students, while camping at Walayar, snatched the opportunity of their visit to Palghat, and played a friendly match with the Victoria College Team, on the 13th September at Palghat. The latter won the match by 2 : 0 chiefly by the good combination of the plucky quick footed forwards.

* * * * *

Of the Juniors, T. Abraham, being the best outstanding player, has been nominated as the vice-captain—Hearty congratulations to him.

AHMED SHERIFF,
Captain.

Hockey.

The Senior Division of the College played a match at Palghat with the Government Victoria College on Sunday the 16th September, 1934. Both the teams were equally strong. As the ground was not good (being under

repair) it proved difficult to exhibit the best of our game. Md. Ali and Robeiro played well in the forward line, and could have done better, if the ground had been a good one. Ahmed Sheriff the right half and Ramajayam the left-in played an excellent game which was well appreciated by the spectators. In the first half Sakaram, our goalie defended once a very fine ball of the opponents at the risk of falling and successfully removed the ball off the goal area.

As regards the Victoria College team, the forwards were very good, and tried their best for a score, but owing to the good defence from our side they were not able to do so. In the end we won the match by 1 : 0, scored by V. Govinda Menon.

A very large gathering turned up to witness the match.

Our thanks are due to the President and the Second Senior Instructor, for their having taken such keen interest and kindly allowing us to play the match.

* * * * *

Junior Student Z. Kuraishi, one of our best players, has been nominated vice-captain for hockey.—Hearty congratulations to him.

S. SIRAJUDDIN,
Captain.

Tennis.

We played two matches against the Agricultural College, but unfortunately, as we were pitted against strong opponents and we lacked in practice and combination, we lost both the matches, the scores being 6–4, 6–4, and 6–2, 9–7. Messrs. T. R. Vijayaraghavan and V. Govinda Menon represented the College in both the matches.

V. G. M.

M. F. C. Debating Society.

The above society had a very busy time during the month of August, when four meetings were held. The first meeting was held on the 13th when the inaugural address was delivered by Dr. E. K. Janaki Ammal, M. A., M. Sc., D. Sc., F. L. S., Geneticist, Imperial Sugar Cane Institute. As the President quite appropriately remarked, it was really a happy augury to have such a learned speaker delivering the first address.

The next meeting of interest was the one in which the President of the Society, P. W. Davis Esq., I. F. S., delivered a very lucid and learned lecture on 'A Concept of Evolution'; A. A. Khan Esq., I. F. S. presided.

In a general body meeting it was proposed and unanimously resolved to start inter collegiate debates between our College and Agricultural College. We intend to have several inter collegiate debates; and we hope to be successful with the whole hearted cooperation of the other institute and the keen interest of our members. It is worth mentioning here that for this idea of starting the inter collegiate debates we are indebted to our President who takes the keenest interest in the activities and welfare of the society.

The following have been elected as the Managing Committee members :—

1. *Asst. Secretary & Treasurer* :—Veerapomboi (Junior).

Other members :—

2. Cherian } (Juniors).
3. Sreedharam Pillai }
4. A. Yegnaswamy } (Seniors).
5. K. Subbanna }

AHMED SHARIEFF,
Hon. Secretary.

CAMP NOTES.

Walayar.

The weather was in striking contrast to that experienced last year, and but for one light shower no rain fell during the period. The shallow well which served last year was bone-dry, and the Walayar stream from which we were obliged to draw all our requirements of water was far from ideal for the purpose, being shallow and muddy, and not above suspicion of contamination from the village up-stream. The College water-carts were accordingly requisitioned as chlorination outfits, a use not originally contemplated for them.

* * * *

The current year's regeneration area (coupe VIII) presented a contrast with last year's aspect. A year ago a goodly portion of the coupe was waterlogged, and we had a poor opinion of the chances of survival for any teak stumps which might be put here. The results were happier than we expected to find, although casualties had been numerous. The majority were wilting badly, a most unusual feature at this season of the year, and a circumstance which we thought could not be entirely due to absence of moisture in the soil but to the high "wilting point" which is characteristic of heavy clays. The soil working which we saw being done was the obvious remedy.

* * * *

A few soil sample pits were dug in coupe IX which is now being felled (a task reminiscent of blistered hands last June!). Three feet of solid black clay was all that rewarded our efforts in the eastern portions—and then we gave it up. An interesting profile was found in the central and rather higher parts where the best growth

was found. Here the top stratum was a stiff dark-brown clay for 1′ 9″ the humus being indistinguishable ; under this was a conglomerate of coarse gravel, calcarious nodules and lumps of silicate as big as one's fist, all cemented into a hard mass with the interpenetrating clay; below this at a depth of 3′ 6″ was a coarse loose red sand rich in mica which continued below 6′ to unknown depth. An interesting feature was that although the pit was dug within a well stocked forest of fair dimensions, not a single root was found penetrating below the conglomerate layer. These several strata were obviously not formed *in situ* from the parent rock and must have been deposited by floods and heavy erosive action from the hill-slopes above, in past epochs. An ecological survey was also conducted on this area.

* * * *

Fire Drill Demonstration.

Havildar Venkataraman proved a keen exponent of the art of fire fighting. He contributes the following note :—

"A surprise demonstration was held on the 14th September, under the supervision of the Principal and the 2nd Senior Instructor. Dry brushwood was gathered and piled in a large heap sufficiently far away from the College sheds, and ignited at 6-45 p. m. against the wind. A miniature shed had been built alongside, containing camp-chair, bed and cot. The heap burnt furiously, and when the fire was in full swing the alarm was given by whistle. The students rallied to the scene in a short time with buckets and available appliances for extinguishing the fire. They were divided into three parties, a 'Rescue party' and a 'Hook party' of four each and the remainder detailed as a 'Bucket line' party. The 'Rescue

party' ran to the shed and pulled out the things inside and out of reach of the fire, after which they reported to the Havildar and were ordered to join the 'Bucket party'. The 'Hook party' gallantly hauled down the roof of the shed and dragged the rest of it away; then they turned to the burning heap and beat it and scattered sand on it. Water had to be obtained from the stream which was 440 yards away. Four students ran to get the water-cart, but in their haste couldn't stop it in time so that we nearly lost our cart in the flames and one student was nearly carried on to the heap! The demonstration was successfully managed and the fire extinguished in 8 minutes." Our bucket relay was the weakest link and had the flames had more material to feed upon it is feared that they would have got out of hand before the first bucketful arrived from the stream!

Visit to the Palghat Match Factory.

On Saturday 15th September the Senior students left the Walayar camp for Palghat, to study the working of the Match Factory near the Railway Station. Thanks to the Manager of the factory, aud to Mr. S. Khader Mohideen Sahib Bahadur (Inspector of Excise, Palghat Circle), the students were shown round, and the working explained in detail. The following were seen: First, the sawing of the logs into billets to suit the length of the veneer knife, the logs used being chiefly of *Bombax malabaricum; Spondias mangifera* and *Mangifera indica* are also occasionally used. The next stage is the removing of the bark by beating it out. The barked billet is then placed in a rotary veneering machine which peels it off spirally into long lengths of veneers. A sharp projecting pin makes a dent in the billet as it rotates, so that the veneer comes out in two halves. The latter are then piled into suitable heights and placed in the splint-cutting

machine which chops off the veneer pile into thousands of splints. The latter are then spread out on the ground, in the open, and sun dried. The veneers for the boxes are hung out in closed verandahs to dry in shade. As the duty for the finished matches has recently been raised considerably, the factory in Palghat does the manufacture of the matches only upto the dipping stage, and exports the unfinished matches elsewhere for the last stage, viz, the tipping with chemicals. It was no small surprise to learn that a heavy duty is being levied even on the unfinished matches.

Thanks to the Proprietor, some interesting photographs and exhibits were added to the College Museum, showing different stages in the manufacture, from the raw material to the nearly finished product.

Notifications relating to Rangers.

Waltair Circle.

17—7—34. Mr. Y. Vydyanatham, on special duty at Repalle granted leave for one month from the afternoon of 11-7-1934.

7—8—34. Mr. V. Rangachari, Forester First grade (M. R. H.), will continue to act as Ranger Seventh grade, from 1-7-1934 *vice* Mr. C. S. King, Ranger Second grade, granted leave for 4 months.

4—9—34. The leave for 3 months granted to Mr. P. Gopalan, extended by one month. 2. Mr. A. S. Kaunds, Forester Second grade, M.R.H., promoted to act as Ranger, Seventh grade, *vice* No. 1 above.

4—9—34. Mr. Ch. Ramamurti, granted leave for one month from date of relief.

1—13—34. 1. Mr. M. A. H. Kirmani, attached to Bontha Range, Ganjam Dn., transferred to Palakonda Range, Vizagapatam Dn. 2. Mr. M. Umapathy Mudaliar, Palakonda Range, on relief by No. 1, transferred to Berhampur Range, Ganjam Dn.

Bellary Circle.

2—9—34. Mr. K. Purushotham Rao, Anantapur Division, granted leave for six months from the forenoon of 21st August 1934.

13—9—34. Mr. C. R. Rajagopalan Pecheruvu Range, Kurnool West division granted leave for four months from 7th September 1934.

11—8—34. Mr. T. M. Kristnamachari, on special dnty, Kurnool South Division transferred to Kadiri Range, Anantapur division.

11—8—34. Mr. A. Rahim Khan, Cuddapah North Division, on expiry of his leave on 21st August 1934 posted to Kurnool Range, Kurnool West Division. 2. Mr. A. K. Sheriff, Kurnool Range, Kurnool West Division on relief by No. 1 transferred to Ganjivaripalle Range, Kurnool East Division. 3. Mr. B. Gulab Singh, Forester First grade, and acting Ranger Seventh grade Ganjivaripalle, on relief by No. 2 reverted to his permanent post of Forester in the same Division.

15—8—34. Mr. K. Purushothama Rao, Kadiri Range, after relief by Mr. T. M. Krishnamachari posted for special duty to Kurnool South Division.

15—8—34. Mr. B. T. Seetharama Ayyar, Kurnool West Division granted extension of leave for one month from 12th August 1934.

15—9—34. Mr. B. T. Seetharama Ayyar, Kurnool West Division granted extension of leave for one month from 12th September 1934 in continuation of the leave already granted,

Salem Circle.

7—8—34. 1. Mr. H. E. Mac Bride, on return from leave, posted to Chamala Range, Chittoor division. 2. Mr. K. Karunakara Nambiyar, Chamala Range, on relief by No. 1, posted to Tammampatti Range; Salem South division. 3. Mr. M. B. Kalappa, Trained Forester, First grade, and Ag. Ranger Seventh grade, on relief by No. 2, will revert to his permanent post as Forester First grade, Vellore West division.

22—8—34. 1. Mr. K. M. Gopalachari, on return from leave on 27-8-1934, posted to Dharmapuri Range. 2. Mr. M. R. Doraiswami Ayyar, Dharmapuri Range, on relief by No. 1, posted to Denkanikota East Range, Salem North division, *vice* Mr. P. A. Krishnaswami Mudaliar, granted leave. 3. Mr. Pakkiyanathan, Krishnagiri Range, Vellore West division, posted to the Sandalwood Sale depot at Tirupattur. 4. Mr. E. W. Fernandez, Ranger Fourth grade, Sandalwood Sale depot at Tirupattur, posted to Krishnagiri Range.

22—8—34. Mr. P. A. Krishnaswami Mudaliar, Denkanikota East Range, granted leave for 4 months from 18-8-1934 or from date of relief.

29—8—34. Mr. S. Rangamannar Doss, Acting Ranger on patta sandalwood duty, in Salem North division, posted to Denkanikota East Range, *vice* Mr. P. K. Krishnaswami Mudaliar, granted leave and until Mr. M. R. Doraiswami Ayyar takes charge of the range.

2—9—34. Mr. K. Karunakara Nambiyar, Chittoor division, granted leave for three months from 24-8-1934.

2—9—34. Mr. M. R. Doraiswami Ayyar, Dharmapuri Range, granted leave for one month from date of relief. 2. Mr. S. A. Dawson, Salem Central division, on return from leave on 11-9-1934, posted to Tammampatti Range, Salem South division. 3. Mr. S. Rangamannar Doss, will continue to hold charge of Denkanikotta East, Salem North, in addition to his other duties until relief by Mr. M. R. Doraiswami Ayyar.

6—9—34. Mr. S. Rangamannar Doss, Trained Forester and Ag. Ranger Seventh grade, will be in sole charge of Denkanikotta East Range, Salem North division until relief by Mr. M. R. Doraiswami Ayyar granted leave. 2. Mr. M. B. Kalappa, Trained Forester and Ag. Ranger Seventh grade, on relief from Tammampatti Range by Mr. S. A. Dawson will continue to act as Ranger Seventh grade on special duty in connection with the settlemant operations relating to reservation of Bailnad, Perumalmalai and Adukkam Puducombai blocks.

22—9—34. Mr. P. Shunmugasundaram Pillai, Trained Forester First grade and Ag. Ranger Seventh grade, will continue ot act as Ranger Seventh grade from 15-8-1934, *vice* Mr. S. M. Srinivasagam Pillai, Ranger Fourth grade, on leave.

26—9—34. (1) Mr. S. M. Sreenivasagam Pillai, on return from leave on 29—9—1934, posted to Atur Range, Salem South division. (2) Mr. P. Shunmugasundaram Pillai, Trained Forester First grade and Ag. Ranger Seventh grade, on relief by No. 1, will revert to his permanent post as Forester First grade, Chittoor division.

3—10—34. Mr. M. R. Doraiswami Ayyar, on return from leave posted to Denkanikota East Range, Salem North division, reverting S. Rangamannar Doss to his permanent post as Forester.

5—10—34. Mr. S. Rangamannar Doss, Trained Forester and Ag. Ranger Seventh grade, on relief from Denkanikota East Range, Salem North division, posted to Anchetti Range, in the same division. (2) On relief by No. 1, Mr. P. K. Subbanarayana Ayyar, posted to be on special duty in the same division for enumeration of sandalwood trees in pattalands.

Working Plans Circle.

2—10—34. Mr. A. N Ponniah. Ranger Fifth grade, Provincial Silviculturist's Division and under orders of transfer to Ootacamund Circle granted an extension of leave for one month from 8—9—1934.

Coimbatore Circle.

12—9—34. Mr. P. Ramaswamy Ayyar, Pollachi Range, granted leave for two months with effect from date of relief.

12—9—34. Mr. V. P. Narayana Menon, Range Officer, Pollachi Timber depot posted temporarily to Pollachi Range in relief of Ranger P. Ramaswami Ayyar granted Medical leave.

Ooty Circle.

13—8—34. Mr. A. N. Ponnayya, posted to Nilambur division as an Assistant Ranger.

18—9—34. Mr. S. V. Doralswami Ayyar, Kannoth Range, Wynaad Division granted leave on average pay without medical certificate for two months from date of relief. (2) On completion of the timber transit check work, Mr. M. M. Mandanna, Ranger Sixth grade, posted to Kannoth Range, Wynaad division (Vice No. 1).

18—9—34. Mr. P. A. Madhavan, on expiry of his leave on 11th October 1934, re-posted to Mudumalai Range, the Nilgiris division.

19—9—34. Mr. A. Muhammad Akbar, Ranger Seventh grade (Temporary), on expiry of his leave on 5th October 1934, posted as Assistant Ranger, Chedleth Range, Wynaad division.

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